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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/581,663	08/03/2000	VOLKER BECKER	10191/1466	4295

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EXAMINER

AHMED, SHAMIM

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 07/05/2002

16

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/581,663	BECKER ET AL.	
	Examiner	Art Unit	
	Shamim Ahmed	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 April 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 32-69 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 32,35,39-52,54-61 and 64-69 is/are allowed.
- 6) ☒ Claim(s) 33,34,36-38 and 62 is/are rejected.
- 7) ☒ Claim(s) 53 and 63 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: Specification contains trademark such as "Teflon-like" (see page 6,10,12,15,16,19). The word "Teflon" should be capitalized in the specification. It is noted that applicant agreed to provide the necessary changes upon completion of the prosecution on the merits (see page 13 of the response filed 4/4/02).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 36 –38 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 36 recites the limitation "the freely accessible silicon surface" in line 11. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 33,36-38 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al (5,313,836) in view of Wolf (Silicon Processing For the VLSI ERA) and further in view of Tang et al (6,211,092).

Fujii et al disclose a method for manufacturing a semiconductor sensor, wherein a silicon substrate is etched to form trenches using silicon oxide as a mask. Fujii et al also disclose that separating layers (108,104) are etched in a second etching process and finally a third etching is performed to etch a further silicon layer to form a free-standing structure (col.6, lines 37-51 and figures 3G-3H). Fujii et al fail to teach the etching using a dry chemical treatment such as plasma etching instead of a wet etching.

However, Wolf et al teach that dry etching has important manufacturing advantage of eliminating handling, consumption and disposal of relatively large quantities of dangerous acids and solvent used in wet etching (page 539). Wolf et al also teach that etching gas can be used SF_6 or CF_4 and occasionally oxygen can be added to increase the etching rate of silicon (see table on page 546 and pages 549).

It would have been obvious to one skill in the art to replace Fujii et al's wet etching with a dry etching process for eliminating handling, consumption and disposal of relatively large quantities of dangerous acids and solvent used in wet etching as taught by Wolf et al.

Modified Fujii et al fail to teach the introduction of a polymer forming monomer into the etching process. It is known in the art that any fluoro or chloro carbon -containing etching gas will form polymer in the side- wall of the trench. In addition, Tang et al disclose an etching process, wherein a polymer forming gas such as C_4F_8 is introduced

for etch selectivity (col.5, lines 55-65 and col.6, lines 6-15) and also for providing side-wall passivation and thereby reducing bowing of the via hole or the trench (col.9, lines 52-59). As to claim 38, it would have been obvious that the ionic bombardment will prevent the formation of the polymer film on the locations accessible for perpendicular ion incidence because all the constituents are similar as the claimed invention. As to claim 62, Tang et al teach that oxygen interacts with the carbon of the polymer to form volatile carbon monoxide, which is eventually removed from the etching chamber and also teach that oxygen plasma can be used to efficiently remove polymer material (col.10, lines 9-13).

Therefore, it would have been obvious to one skilled in the art to combine Tang et al's teaching into Fujii et al's modified method to increase the etch selectivity and also to reduce bowing of the trenches as taught by Tang et al.

7. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al (5,313,836) in view of Wolf (Silicon Processing For the VLSI ERA) and Tang et al (6,211,092) as applied to claims 33,36-38 above, and further in view of Flamm et al (4,310,380).

Modified Fujii et al discussed above in the paragraph 6 but fail to teach the silicon substrate is isotropically etched using a fluorine- containing etching gas as the context of claim 34. However, Flamm et al teach that fluorine-containing gas such as chlorine trifluoride or bromine trifluoride is used to etch silicon isotropically at uniform and relatively high etching rate with respect to other such as silicon oxide (col.1, lines 62-67, col.7, lines 16-32). Therefore, it would have been obvious to one skilled in the art at the

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time of claimed invention to employ Flamm et al's teaching into modified Fujii et al's method for uniform and selective etching of silicon as taught by Flamm et al. By doing so, one could have a high etching rate at a relatively lower power levels and higher selectivity with excellent uniformity as taught by Flamm et al.

Allowable Subject Matter

8. Claims 53 and 63 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
9. Claims 32,35,39-52, 54-61 and 64-69 are allowed.
10. The following is a statement of reasons for the indication of allowable subject matter: the prior art does not teach or suggest the introduction of a third separating layer and also does not teach the formation of a conductive layer in such a way that the conductive layer is completely enclosed by the first and the second separating layer as the context of 32. The prior art also does not teach that the electrical contact surfaces remain free from the polymer coating as the context of claim 43.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Suzawa et al (5,728,259) discloses a conventional etching process, wherein a silicon substrate is etched without using plasma.
12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

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§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (703) 305-1929. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (703) 308-4333. The fax phone numbers for the organization where this application or proceeding is assigned are (703)-305-7718 for regular communications and (703) 872-9311 for After Final communications.

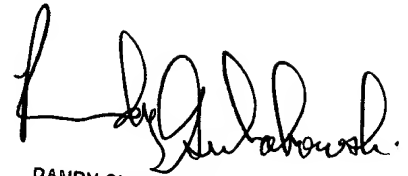
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

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Shamim Ahmed
Examiner
Art Unit 1746

SA
July 1, 2002

A handwritten signature in black ink, appearing to read "Randy Gulakowski". The signature is fluid and cursive, with the first name "Randy" and last name "Gulakowski" clearly distinguishable.

RANDY GULAKOWSKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700